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FHR

Currents...

Fish Habitat Relationships Technical Bulletin
Number 19 August 1995



Annual Accomplishment Report -- 1994 Fish Habitat Relationships Program

I. Purpose

Effective management of diverse and complex aquatic resources on National Forest System lands requires biologists to have the best possible understanding of aquatic ecosystems and processes that influence aquatic resources. The Fish Habitat Relationships (FHR) Program provides a broad framework for development of technology, and dissemination of this technology to biologists. Following is the annual report of the USDA Forest Service, Fish Habitat Relationships (FHR) Program. This summarizes accomplishments from the national FHR program, as well as Regions 1,2,4,5, 6 and 10.

As you will see, the program has expanded its efforts in every area. We've developed more technical applications and expanded our technology transfer efforts in an attempt to meet the needs of biologists in all regions. We look forward to 1995 as a year where our programs will continue to provide high quality technical products and aggressive technology transfer. For information regarding national products and programs please contact us here in Logan. For regional products please contact the regional representative listed inside.

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Forest Service Fish Habitat Relationships Program Leaders or Representatives

FHR Currents Purpose

The USDA Forest Service Fish Habitat Relationships Program was established to further the development of fisheries technology and transfer this technology to field biologists. With ever increasing demands for natural resources, protection and management of aquatic communities requires biologists to be knowledgeable of current research findings and state-of-the-art techniques. The purpose of *FHR Currents* is to provide a vehicle to quickly disseminate information important to field-level biologists in the USDA Forest Service

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II. Background

In 1981, a national steering committee was established to develop a program to provide systematic methods for evaluating fish and wildlife habitats and applying that information in land management planning and project decisions that affect fish and wildlife habitat. In 1982, at the recommendation of the steering committee, a Wildlife and Fish Ecology Group was established to develop a framework for what was to become the Wildlife/Fish Habitat Relationships Program.

The primary goal of the Fish Habitat Relationships program is to promote "Technical Excellence in the Forest Service Fisheries Program". There are two primary elements identified in the program: (1) the development of technology to assess fish habitat condition and understand fish/habitat relationships, (2) the transfer of technology to fisheries biologists in the field.

The National Fish Habitat Relationships (FHR) program is currently based at Utah State University in cooperation with the Fisheries and Wildlife Department, College of Natural Resources. The National Aquatic Ecosystem Monitoring Center (AEMC) is a satellite program associated with the FHR program in Logan. Regional programs are located in six of the nine Forest Service regions. In addition, Regions 1 and 4 of the Forest Service, in cooperation with the Intermountain Forest and Range Experiment Station, have a technology development/transfer specialist operating within the Fish Habitat Relationships program.

In addition, research scientists from Forest Service Research played a key role in technology development and technology transfer within the FHR program. We would like to acknowledge Danny Lee, Bruce Rieman, and Russ Thurow from the Intermountain Research Station, Mike Young from the Rocky Mountain Station, Tom Lisle and Kathleen Matthews from the Pacific Southwest Station, Gordon Reeves, Jim Sedell, Kelly Burnett, Mason Bryant, and Bill Meehan from the Pacific Northwest Station, Andy Dolloff and Pat Flebbe

from the Southeast Station, Mel Warren from the Southern Station, Ted Angradi from the Northeastern Station, and Clay Edwards from the North Central Station as important contributors to the FHR program.

Applying Technology To Management Problems

This was a year where FHR personnel and information continued to play a significant role in major resource issues. FHR personnel remain highly involved in the Forest Ecosystem Management Assessment (FEMA) for the northwest, the Pacific Fish Strategy (PACFISH), and the implementation and modification of "Watershed Analysis" as part of the FEMA effort. In addition, FHR personnel were heavily involved in the Habitat Conservation Assessments for Bull trout and inland cutthroat trout as well as efforts in the Columbia River Basin Eastside Assessment and the Alaska Fish Habitat Assessment.

III. National Fish Habitat Relationships Program

Technology Development

The FHR program cosponsored four fish/habitat relationships projects with three National Forests during 1994. These projects provided information on high lakes sampling and inventory protocols, comparisons of stream inventories at high and low flows, the influence of fish movement on the interpretation of habitat inventory data, and the effectiveness of large woody debris inputs to improve cutthroat trout habitat.

Research/Management Partnerships

Corvallis Forest Science Lab/FHR

The Corvallis Forest Science Lab and the FHR unit cosponsored a project to develop monitoring sampling strategies over large landscapes. Scientists from Oregon State University and Humboldt State University are involved with this project. The objective of the project is to develop statistically valid aquatic/riparian monitoring strategies over large landscapes.

Boise Forest Science Lab/FHR

Working together with the Intermountain Station and Utah State University, the FHR unit jointly sponsored a project to explore the effects of habitat fragmentation on the population stability of Colorado River cutthroat trout.

Objectives are to develop a management model for biologists looking at habitat area, complexity and their influence on effective population sizes. The purpose of the model is to help biologists understand the risk to a population given the size of the area inhabited by the population and the condition of the habitat. It will help predict the relative risk of management activities to the population of interest.

Technology Transfer

Continuing Education Courses

The FHR and Aquatic Ecology Monitoring Unit has demonstrated a commitment to continuing education by sponsoring not only the original core set of continuing education classes, but expanding the curriculum to include technical courses that are relevant to fisheries biologists. The following are the courses offered by the Unit in 1993, a brief description of content, and numbers and types of participants.

Basin Surveys and Applications - This course is designed to provide biologists and hydrologists with statistically reliable survey method for aquatic inventories. We hosted one course in 1994, with a total participation of twenty people.

Program Management for Biologists and Botanists - This course is designed to provide biologists and botanists with skills to conduct successful fish, wildlife and botany programs. Participants included twenty-four biologists from all regions of the Forest Service.

Fish Habitat Management - Designed to provide mid-career biologists with new ideas and concepts in fish habitat management. Two courses were offered, serving fifty-four participants from the Forest Service, two state agencies, and BLM.

Lakes and Reservoir Management - Designed to present ideas and concepts related to lake ecosystems and lake management. Twelve biologists from Forest Service, BLM, and one state agency attended.

Aquatic Ecosystem Monitoring - We added a new course to our program in response to the growing need for high-quality aquatic resource monitoring programs. This is a 5-day course designed to familiarize field unit specialists with the components necessary to develop and conduct a successful monitoring program, including: defining monitoring objectives; developing a statistically-based study design and use of proper analytical procedures; knowing how to deal with variability associated with aquatic systems; how such variability affects monitoring procedures such as aquatic macroinvertebrate biomonitoring, channel morphology monitoring, water temperature monitoring, sediment monitoring, and fish habitat/population monitoring. Eighteen participants from six Forest Service Regions and two BLM Resource Areas attended this course.

Presentations

National FHR personnel presented thirteen papers and lectures at national and regional American

Fisheries Society meetings, the National North American Benthological Society meeting, and several Forest Service regional workshops.

Program Assistance

FHR personnel assisted with the Inland Habitat Conservation Assessment for Cutthroat Trout, the development of watershed analysis procedures, inventory and monitoring procedures for the PACFISH strategy, and assessment of the effectiveness of the Tongass Timber Reform Act to protect anadromous fish habitat. In addition, we visited numerous forests to provide assistance.

In addition to the functional assistance requests, the FHR unit publishes a monthly computer newsletter, "THE FISHWORKS". The purpose of the newsletter is to share information between biologists, hydrologists, and researchers. In 1994, the *FHR Currents* was published three times this year. Publication and coordination for the "Currents" is provided by Karen Kenfield and the FHR staff in Region 5. We also provide information on request for various products and literature.

IV. National Aquatic Ecosystems Monitoring Center (AEMC)

Technology Development

In 1994, we developed Monitoring Technical Bulletins and established a monitoring reference library.

These short publications provide a brief summary of field techniques that are typically used in aquatic monitoring. In FY94 we developed three technical bulletins:

- Field Equipment for Aquatic Macroinvertebrate Sampling - a list of items needed to conduct macroinvertebrate biomonitoring. AEMC Tech Bull 1:93 (revised).

- Biological Monitoring of Lakes and Reservoirs - description of methods used to assess lake/reservoir productivity and trophic state via biological measures AEMC Tech Bull 2:93.
- Stream Water Temperature Monitoring - description of methods used to monitor stream water temperatures. AEMC Tech Bull 1:94.

In addition, Mark Vinson of the Lab and Ted Angradi of the Northeast Forest and Range Experiment Station conducted a survey to evaluate the extent of macroinvertebrate monitoring activities on public land, attitudes towards aquatic macroinvertebrate monitoring, methodologies, and training needs. The results will be published as a General Technical Report in spring of 1995.

Aquatic Reference Library

We established an aquatic reference library comprised of more than 280 papers from primary and grey literature that relate to the monitoring of aquatic resources. These articles are categorized into 13 subject areas:

General Aquatic Ecology
Aquatic Macroinvertebrates
Bedload Sediment
Fine Sediment
Cumulative Watershed Effects
Fluvial Geomorphology
Fish Habitat
Fish Populations
Water Quality and Chemistry
Riparian Zones
Woody Debris
Water Flow
Water Temperature

Units can order individual papers or packets containing all articles in each subject area for a minimal fee. The response to the reference library service has been overwhelming. We mailed or delivered more than 8,014 papers (461 packets) to individuals from more than 40 National Forests in all eight Regions during FY94.

Technology Transfer

Regional Pilot Program

The goal of the Monitoring Center's Pilot Monitoring Program is to highlight one or more critical aquatic monitoring issue(s) in each Region, and to provide leadership and direct assistance in conducting a large-scale monitoring effort directed at these issues. Pilot projects were established in coordination with Forest Service Research stations, Regional FHR Coordinators, and/or an individual National Forest. The Monitoring Center helped to develop each monitoring plan, provided dollar resources, field training, and actual on-site assistance in data collection. Many of these pilot projects are cooperative studies with academic institutions and state resource agencies.

The following is a summary of the ongoing pilot projects in FY94:

- Region 1: Bitterroot National Forest (R. Torquemada) and Montana State University
- Region 2: Medicine Bow National Forest, Rocky Mountain Research Station (R. Rader), and Wyoming State University (M. Reyes)
- Region 3: Tonto National Forest (L. Bizios and T. Willard), Arizona Game and Fish, and Arizona State University
- Region 4: Montpelier Ranger District (M. Johnson, R. Brassfield), Caribou National Forest (L. Lefferts), and Idaho Fish and Game (D. Scully)
- Region 5: Plumas National Forest and Pacific Southwest Station (K. Roby)
- Region 6: Deschutes National Forest (T. Merritt) and Oregon Department of Fisheries and Wildlife
- Region 8: Southern Experiment Station (M. Warren, W. Hagg) and Alabama National Forests
- Region 9: Chippewa National Forest (C. Cook, N. Salminen, B. Glenn)

Section 7 Monitoring Plan for the Upper Columbia River Basin

We served on a committee to develop a standardized protocol for monitoring anadromous salmonid habitat in the upper Columbia River basin. This protocol is based on the six habitat elements identified in PACFISH and focuses on specific procedures for reducing sources of variability that seem to plague many of our aquatic monitoring efforts. The Center provided lead authorship in writing this document, which was reviewed by many members of the FHR group and other salmonid experts throughout the Northwest. This document is also being proposed for interregional use in monitoring the PACFISH strategy as well.

Aquatic macroinvertebrate processing

AEMC processed over 3500 macroinvertebrate samples from National Forests and BLM lands. In addition, the lab processed samples for four state agencies and two other federal agencies. Laboratory processing and report generation times are now less than one year at both facilities. For example, at the Logan lab sample process times averaged 54 days with a maximum of 131 days and a minimum of three days. The average time to complete analysis reports from the date the sample was received was 84 days, with a maximum of 191 days and a minimum of four days.

Program Assistance

The technical assistance part of the Center's program provides direct assistance to all requesting field units on any aspect of aquatic resource monitoring. This has included activities such as telephone consultation, DG correspondence, on-site instruction in data collection methods, field reviews to comment on established programs, shipping of field equipment kits, meetings with Forest and Districts to develop monitoring plans, processing and analysis of biological monitoring samples, and critical review of proposed monitoring strategies and progress reports. In FY94, we provided technical assistance to 28 National Forests in all nine regions of the Forest Service.

Monitoring Plan for the Chippewa National Forest

The Chippewa National Forest in northern Minnesota appears to contain more water than land. With more than 650,000 acres of lakes on the Forest, and many miles of streams, aquatic resources play an important role in its management. Minnesota is renowned for its sport fishing opportunities and the Chippewa contains many lakes in the upper Mississippi drainage which host large populations of walleye, northern pike, muskellunge, large-mouth bass, crappies, bluegills, and yellow perch. Extensive lakeshore development, timber harvest and associated roading, and lake level regulation are some of the principal land use issues.

In this project, we are assisting the Chippewa develop a comprehensive monitoring plan to assess implementation and effectiveness of its Forest Plan. This region represents a challenge to aquatic resource specialists, in that methods typically used for inventory and monitoring (e.g., channel-typing stream surveys, stream benthic invertebrate biomonitoring, etc...) cannot be used. We are modifying and adapting techniques for use in this unique environment. In FY94, we visited potential field sites and began the process of developing the monitoring plan. Each District on Forest has taken on responsibility of writing part of the plan.

V. Rocky Mountain Region

Technology Development

In FY94, the Region 2 FHR program initiated, continued or completed approximately eight technology development projects. These projects involved four National Forests, one research station and three universities. A wide variety of technology was developed to aid fisheries managers including hierarchical classifications for watershed inventories, instream flow methods to develop bypass flow recommendations, decision

support tools using Geographic Information Systems, and models to predict stored gravel quantity and quality based on important watershed, land-use, and channel characteristics.

Richmond, A. D. and K. Fausch. Characteristics and Function of Large Woody Debris (LWD) in Mountain Streams of Northern Colorado.

Leonard, S. and T. Wesche. Evaluation of the Effects of Reservoir Storage on Spawning Gravel Quantity and Quality in Douglas Creek.

Goyne, L., T. Wesche and Q. Skinner. Responses of Hydraulic Geometry and Channel Morphology in Battle Creek, Wyoming.

Reyes, M., K. Gerow and R. Rader. Invertebrates as Indicators of Biotic Integrity in Montane Wetlands.

Swift, S., B. Johnson, K. Fausch and M. Young. Evaluation of Habitat Requirements and Distribution of the State Endangered Rio Grande Sucker (*Catostomus plebeius*) in Colorado.

Gullett, K. and T. Wesche. Instream Flow Investigations for the Rocky Mountain Region, USDA-Forest Service.

Schmal, R. N. and J. Hammerlinck. Development of Decision Support Tools for Watershed Managers using Geographic Information System (GIS) and the Region 2 Integrated Resource Inventory (IRI) Information Layers.

Schmal, R. N. And T. Wesche. Hierarchical Classifications Using Physical Characteristics of Watersheds for Management of Western Public Lands.

Technology Transfer

Technology transfer is a primary activity of the FHR program. In 1994, the R-2 FHR program leader participated in eight major technology transfer activities within and outside of the Region. Some of these activities included a continuing education short course in GIS, and presentations to external audiences, and conducting literature searches for aquatic specialists in the Region.

Nick Schmal and Mike Young of the Rocky Mountain Station and Region 2 FHR unit, presented a poster, "Mobile Trout: Consequences of a New Paradigm" at the Wild Trout V Symposium, Mammoth Hot Springs, Yellowstone National Park, September, 1994. Trout living in small streams have been thought to move very little, often occupying single pools their entire lives. Recent research in southern Wyoming has demonstrated that adult brown trout may seasonally move as far as 96 km, and over one km in a single

night. Much smaller native Colorado River cutthroat trout also move several kilometers seasonally. Fragmenting streams may be reducing the chances of persistence of native trout species by restricting movement and thus restricting population size.

Special Programs, Projects and Assignments

The unit assisted in conducting a Habitat Conservation Assessment for the Category 2 sensitive Colorado River cutthroat trout (Utah, Colorado and Wyoming). Primary information has been entered into a Dbase program. All locations of known A-B purity trout are mapped. Locations will be spatially located and attributed in a GIS on 1:100,000 scale hydrography layers. Completion is expected during the winter of 1994-1995.

Research/Management Partnerships

Laramie Forest Science Lab/Region 2 FHR/NAEMC

The overall goal of this new project is to evaluate effects of timber harvest on aquatic macroinvertebrates in montane wetlands located in the Snowy Range Mountains. This project is co-funded by the R-2 FHR Unit and the Forest Service National Aquatic Ecosystem Monitoring Center and is designated as a demonstration project for the Rocky Mountain Region. Cooperators include the Departments of Zoology and Physiology and Statistics at the University of Wyoming; the Rocky Mountain Forest and Range Experiment Station (RWU 4301); R-2 FHR Unit and the National Aquatic Ecosystem Monitoring Center at Utah State University. Project completion is expected in June 1996.

State and Federal

The Rio Grande sucker is endemic to the Rio Grande drainage, however, there may be only one remaining endangered population in Colorado. The non-game species is more widespread in New Mexico. An attempt will be made to identify biotic and abiotic limiting factors and also to determine additional life history information. Habitat associations for the sucker will be developed and estimates of existing populations made. The project is a collaborative funding effort between the Colorado Division of Wildlife (CDOW) and the R-2 FHR Unit. A proposal for additional funding has been submitted to the National Fish and Wildlife Foundation for a Bring Back the Natives grant. The recovery effort is being coordinated with the State of New Mexico. Cooperators include the Department of Fishery and Wildlife Biology and Larval Fish Laboratory at Colorado State University; the Rio Grande National Forest-Del Norte Ranger District Cooperative Education Program; Rocky Mountain Forest and Range Experiment Station (RWU 4301); CDOW and the R-2 FHR Unit. Project completion is anticipated in June 1996.

The unit also conducted computerized literature searches on a weekly basis and electronically mailed information (Data General system) to all Region 2 fishery biologists and hydrologists. The service began in March 1993, with search topics covering stream and lake-reservoir ecology, instream flows, fish behavior and physiology, population dynamics and habitat evaluations. Other topics included global warming, acid rain deposition, GIS, modelling in aquatic systems and other relevant information. Citations contain abstracts when available.

VI. Intermountain Region/Northern Region/Intermountain Station

Technology Development

Research has been developed in two primary emphasis areas within the unit. These emphasis areas are: (1) research to improve understanding of the effects of stream channel changes and land use on critical habitats of native and sensitive species, and (2) research to improve the understanding of habitat fragmentation on the conservation of native and sensitive species. Thirty research projects have been developed within these emphasis areas resulting in five publications during this year. Other projects are in various stages of development. These partnerships involve regions 1 and 4, two research stations, six universities, and numerous state and federal cooperators.

Effects of channel changes/land use

- Identification of Critical Habitat for Spawning and Overwintering of Cutthroat and Bull Trout in Northern Idaho.
- Cutthroat and Bull Trout - Fish/Substrate Relations Research in Sedimentary Geologic Areas.
- The Influence of Substrate Condition on Spawning and Incubation of Yellowstone Cutthroat Trout in Sedimentary Geologies.

Research Partnerships

Intermountain/Station/Pacific Northwest Station

Research scientists at the Boise Forest Science Lab and Corvallis Forest Science Lab are comparing habitat changes in wilderness and non-wilderness streams to determine the rates of change in the two areas. They hope to understand how forest management has influenced fish habitat characteristics when compared to unmanaged areas.

- Winter Habitat Utilization by Bull Trout and the Influence of Habitat Condition on Overwintering in Granitic Geologies.
- The Influence of Substrate Condition on Spawning and Incubation of Steelhead and Chinook Salmon in Granitic Geologies.
- Comparison of Habitat Changes in Wilderness and Non-Wilderness Watersheds During the Last Five Decades.
- Substrate Characteristics in Spawning and Overwintering Habitat of Cutthroat Trout.
- Habitat Partitioning by Resident and Anadromous Salmonids in Wilderness and Non-Wilderness Watersheds.
- Response of Stream Biotic and Physical Conditions to Watershed Management.
- Analysis of Eighteen Years of McNeil Core Samples from Six Sites in the South Fork Salmon River Drainage.

Habitat fragmentation/conservation of native species

- Development of Size and Age Based Indexes of Salmonid Populations Stability.
- Influence of Habitat Complexity on Trout Population Dynamics.
- Cutthroat Trout Conservation Assessments.

- Population and Habitat Assessment Methods.
- Methods to Assess Jeopardy of Small Populations.

Researchers and FHR personnel from the Boise Forest Science Lab have formed research partnerships with faculty from several universities to study the effects of habitat fragmentation on native bull trout and cutthroat trout.

- Dysfunctional Characteristics of Small Trout Populations.
- Bitterroot Bull Trout Dynamics and Habitat Use.
- Effects of Habitat Fragmentation and Exotic Species Invasion on Persistence of Bull Trout and Other Native Fishes of the Bitterroot River System, Montana.
- Spatial Distribution of Trout and Char in the Spokane River Basin.
- Influence of Habitat Characteristics on Distribution and Persistence of Local Populations of Bull Trout.
- Foothills Fire Effects: Dispersal and Recovery of Local Salmonid Populations in Managed and Unmanaged Watersheds.
- Influence of Habitat Characteristics on the Invasion of Brook Trout and the Potential Displacement of Bull Trout.
- Roles of Brook Trout in Displacement of Native Salmonids.
- Spatial Distribution and Habitat Associations of Amphibians and Reptiles.
- Dispersal and Homing of Bull Trout.

Specific Decision Support Tools

Development of Protocols to Inventory the Status of Bull Trout.

Evaluation of Monitoring Procedures to Assess Effects of Cattle Grazing on Channel Morphology and Fish Habitat. An INT General Technical Report has been published in INT-GTR-311, July 1994.

Development of a Hypertext-Based Synthesis of Published Literature on Quantitative Methods for Assessing the Viability of Small Populations. A hypertext-based information base and report is on-line at INT.

Development and Evaluation of Standard Fish Habitat Inventory Parameters and Procedures for R1/R4 Forests.

Development of a Natural Condition Database For Assessing Habitat Conditions in R1/R4.

Development of a Computerized Fish Habitat Database Management System for Inventory Data. An interim copy is currently being used by R1/R4 Forests. An upgraded system is in development and expected to be available in January 1995.

An Interagency Effort

Boise Forest Science Lab/National Marine Fisheries Service/Bonneville Power Administration

The purpose of this effort is to develop tools to help assess the biological ramifications of land-use activities on anadromous and resident salmonids. The effort is focused primarily on assessing extinction risks for populations of native salmonids. Recently, the effort has been broadened to include assessment of probable aquatic communities.

The most significant development to date is development of a Bayesian viability assessment procedure that was designed to work within watershed analysis. The procedure consists of two modules: one for resident (i.e., non-anadromous) trout and char, referred to as BayVAM x.R, and a companion module for anadromous salmonids, BayVAM x.A (x refers to version number). The BayVAM modules incorporate a hybrid approach to viability analysis that blends qualitative judgment with quantitative rigor to provide a generalized assessment of risk and uncertainty to fish populations.

Region 4 Fish Habitat Inventory Coordination.

Evaluation of Videography as a Habitat Monitoring Tool.

Guide to Underwater Visual Estimates of Fish Abundance in Waters of the Intermountain West. GTR published July 1994.

The Influence of Sampling Method, Physical Features, Species, and Size Class on Sampling Efficiencies.

Program Assistance

The unit completed an update of the R1/R4 standard Fish Habitat Inventory Procedures and companion database management system (FBase) that supports data entry, storage, retrieval and standard data summaries and provided training to Forests in Regions 1 and 4. In addition, decision support tools were developed to support the implementation of watershed analysis within the Regions.

Unit biologists were key participants on the PACFISH Implementation Team, Eastside Assessment Aquatics Team, and Watershed Analyses Team.

VII. Pacific Southwest Region

Technology Development

In FY94, \$200,000 was awarded to the Region's Forest and Ranger Districts via the FHR competitive grant process to fund studies and monitoring projects. The following projects were funded entirely, or in part, by grants received from the Pacific Southwest Region FHR Program.

- Grazing Strategy Effects on Riparian Dependent Biota in the Eastern Sierra Nevada.
- Historic Aquatic Conditions on the East Side, Northern Sierra.

- Impacts of Livestock Grazing on Streams and Resident Golden Trout Populations in the Golden Trout Wilderness, California.

- Limiting Factors for Resident Rainbow Trout Production in the Santa Ynez River Basin, Los Padres National Forest.

Application of Instream Monitoring Protocols to Assess Condition of Meadow and Forested Streams.

1994 was the second year of pilot testing of the R5 Integrated Stream Inventory (ISI). The goal of developing this protocol is to provide reliable information on streams that can be used by both physical and biological resource specialists to inventory and monitor stream conditions. This protocol is being developed by Region 5 hydrologists and fisheries biologists in cooperation with the Pacific Southwest Research Station.

- Long-term Investigation of the Relation between Watershed Recovery and Residual Pool Volume in a Stream Dominated by Excessive Fine-grained Sediment.
- Managing Rangeland to Protect and Aquatic Riparian Ecosystems.
- Movements and Microhabitat Use of Hatchling and Juvenile Western Pond Turtles in the Trinity River Basin.
- Multi-year Population Assessment of Anadromous Salmonid Populations in Horse Linto Creek, California.
- Rainbow Trout Habitat Use in Pools in the Sespe River, California during Periods of Thermal Stress and Low Oxygen Conditions
- Role of Small Wood Debris in Selected Streams on the Tahoe National Forest.
- Ruth Reservoir Recreation Fishing Survey.
- Testing Snorkel Survey Protocol for Juvenile Coho Salmon in Smith River Tributaries.

- Status of Aquatic Species and Their Habitat in Deer and Mill Creek Drainages.
- Timing and Location of Foothill Yellow-Legged Frog Breeding Relative to Environmental Variables in Free-flowing and Dammed River Systems.

Technology Transfer

FHR CURRENTS

FHR Currents is the National FHR Technical Bulletin. Each issue consists of a scientific article on a topic of interest to US Forest Service fishery biologists and other aquatic specialists. *FHR Currents* is published by FHR staff located at Six Rivers National Forest. In FY94, three issues were published:

Consideration of Extinction Risks for Salmonids by Bruce Reiman, Danny Lee, Jack McIntyre, Kerry Overton, and Russ Thurow of the Intermountain Research Station in Boise, Idaho. This article reviews factors influencing the persistence of populations and suggests means for managing resident trout and char populations to mitigate extinction risks. *FHR Currents*, Number 14, December 1993. 13pp.

Standpipe to Determine Permeability, Dissolved Oxygen, and Vertical Particle Size Distribution in Salmonid Spawning Gravels by Keith Barnard, Humboldt State University and Scott McBain, University of California, Berkeley. This paper outlines a new technique to measure permeability and dissolved oxygen while extracting a freeze core from a single in-situ standpipe. *FHR Currents*, Number 15, April 1994. 13pp.

Annual Accomplishment Report -- 1993, Fish Habitat Relationships Program by Jeffrey L. Kershner, National Fish Habitat Relationships Program Leader. This report provides brief summaries of FHR Technology Development and Technology Transfer efforts that occurred during FY93. *FHR Currents*, Number 16, September 1994, 26pp.

VIII. Pacific Northwest Region

Technology Development

Watershed Analysis -FHR personnel were part of the watershed analysis (WA) task group and assisted in developing the aquatic module.

In addition, FHR personnel were part of a group that created a "mini" watershed analysis to develop restoration proposals as part of the "jobs in the woods" program.

Database Development - Regional FHR personnel directed the:

Operational testing of the DG Oracle corporate SMART database in support of the Eastside assessment.

Refinement of field data recorder software to facilitate use and compatibility with the corporate SMART system.

Development of standardized inventory protocols for intermittent channels.

Completion of the Regional Fisheries and Watershed Stream Inventory GIS Database Link. These standards provide for the needed link between stream inventory information and our GIS programs.

Completion of the Regional Fisheries and Watershed Stream Attribute Standards for non-inventoried streams. These standards provide for a consistent approach in data standards, and database structure, for non-inventoried streams.

Survey Protocols - Continued testing of the R6 lake survey protocol.

Section 7 Monitoring Plan - Along with personnel from the National Monitoring Center and BLM, developed a standardized protocol for monitoring anadromous salmonid habitat in the Upper

Columbia River Basin as it relates to the FS/NMFS Section 7 Consultation/Biological Opinions. Protocols were based on the six habitat elements identified in the PACFISH strategy.

Forest Developments - The following projects were funded entirely, or in part with forest funds, by grants or through partnerships.

Deschutes National Forest -

High Lake Stocking Study
Metolius River Bull Trout Study, 1994

Mt. Hood National Forest -

Little Crater Meadows Ecological Studies
Bull Trout Monitoring - Spawning Run Size and Timing

Wallowa-Whitman National Forest -

Stream Temperature, Riparian Vegetation, and Channel Morphology in the Upper Grande Ronde River Watershed, Oregon

Sediment Delivery to Headwater Streams Following Road Construction and Timber Harvest in the Grande Ronde River, Oregon

Riparian Willow and Cottonwood Dynamics on Meadow Creek

Structure, Biomass, and Successional Dynamics of Forested Riparian Ecosystems of the Upper Grande Ronde Basin

The Effects of Intensive Grazing on Groundwater Level, Temperature, and Stream Temperature in the Upper Grande Ronde River Watershed, Oregon

The Effects of Intensive Grazing on Wet Meadow Plant Community.

Upper Grande Ronde River Watershed Monitoring Plan for Water Quality, Fish Habitat and Salmonid Populations

Monitoring Strategy for Spring Chinook Salmon Conservation Strategy

Habitat Improvement for Anadromous Salmonids in Meadow Creek, Oregon and Evaluation of Physical, Biological, and Economic Effects

Historical Changes in Anadromous Fish Habitat in the Upper Grande Ronde River, Oregon, 1941-1990

Production of Wild Salmonid Smolts in Meadow Creek, Oregon, an Upriver Tributary of the Columbia Basin

Spatial Techniques for Modeling Timber-fish Habitat Management Alternatives on the Grande Ronde River System

Impacts of Livestock on Chinook Salmon (*Oncorhynchus tshawytscha*) Spawning Behavior and Redd Integrity

Technical Note on Comparing Use of Dirigo Model 850 and the 950 with Model VII Smith Root Electro-shocker

Winema National Forest -

Mollusc Investigations in the Klamath Basin

Technology Transfer

Aqua-Talk

Aqua-Talk is the Fish Habitat Relationships Program technical bulletin for the Pacific Northwest Region. It was established to provide aquatic specialists (biologists, hydrologist, etc.) with new information, technology, and training being developed in the Region and elsewhere.

Aqua-Talk is distributed to USFS fishery biologists, hydrologists, and fishery agencies in Oregon and Washington. In addition, fishery biologists from the above states are invited to publish a technical paper focusing on their research findings or new techniques. In 1994, three issues of Aqua-Talk were published:

North Fork John Day Dredge Tailings Restoration Project by Shaun P. McKinney and Edward Calame; Umatilla National Forest, Pendleton, OR 97801. Number 5, September 1994.

Stream Temperature Problems and Identification of Restoration Opportunities in Elk River by Chris Park, Hydrologist, Gold Beach Ranger District, Siskiyou National Forest. Number 6, September 1994.

Restoring Ecosystems in the Blue Mountains, A Subwatershed Ranking Process from the "Restoration Team Technical Report '92", Wallowa-Whitman National Forest. Edited by Gregory Hill and Curt Ralston. Number 7, September 1994.

Training

The Pacific Northwest Region has instituted a series of workshops which are designed to supplement and strengthen technical skills of our fisheries and hydrology workforce. The workshops provide consistency and standardization in the approach to aquatic ecosystem management. The workshops are:

1. Stream Survey (Level II)
2. Stream Survey Data Interpretation
3. Fluvial Processes
4. Design and Implementation for Stream Restoration & Enhancement
5. Monitoring & Evaluation (developed in 1994, held in 1995)

Functional Assistance

Continued oversight and assistance as Fisheries Program Coordinator the Regional Professional Retraining program. Four of the five retrainees completed their academic requirements. Two completed their on-the-job-training, and were placed on forests as fisheries biologists trainees.

IX. Alaska Region

Anadromous Fish Habitat Assessment

The Congressional Conference Committee Report on the 1994 Congressional Appropriations Act direct the Forest Service to study the effectiveness of Pacific salmon and steelhead habitat protection procedures on the Tongass National Forest. The assessment was conducted jointly by the Alaska Region and the Juneau Forest Science Lab. The report documents the study utilized to answer the Congressional directives, and provides findings and recommendations.

Technology Development

Beilharz, M., and D. Kelliher. Stream Buffer Strip Stability and Consequences of Blowdown on the Tongass National Forest.

Bryant, M.D. Seasonal Floods, Beaver Ponds, and Juvenile Salmonids: Links to Watershed Productivity.

Denton, C., (Alaska Department of Fish and Game). Evaluation of Salmonid Production from Lower Salmon River Habitat Enhancement Projects.

Frenett, B.J., and M.D. Bryant. Changes in Population Vital Statistics as an Indicator of Interspecific Competition from Enhancement Activities.

Griswold, K. and G.H.Reeves. Genetic Diversity of Coastal Cutthroat Trout in the Vixen Inlet Watershed, Southeast Alaska.

FHR/Research Partnerships

Halupka, K.C., M.F. Wilson, M.B. Bryant and F.H. Everest. Biological Characteristics and Population Status of Anadromous Salmon in Southeast Alaska, Chum Salmon.

Fourth in a series of works on Pacific salmon and steelhead trout. The Juneau Forest Science Lab in conjunction with the Region has sponsored this project to compile information on the life history characteristics, population trends, and phenotypic characteristics of salmonids in Southeast Alaska.

Hannon, J. Steelhead Escapement in Several South Prince of Wales Streams.

Harke, V. An Evaluation of Artificial Spawning Substrates for Coho Salmon.

Killinger, G. Large Woody Debris Contribution to Coho Production from a Small Coastal Stream in Southeast Alaska.

Leary, R., and C.W. Riley, Genetic Divergence between Dolly Varden Above and Below a Stream Barrier.

Reed, D. Applications of Georeferenced Airborne Video on the Tongass National Forest.

Schmid, D., K. Wedemeyer, M. Winger, and S. Zemke. Fish Habitat Relationships and Limiting Factors Associated with Enhancement in a Northern Coastal Rainforest.

Thomas, C. An Evaluation of Salmon Production Following the Construction of Two Alaska Steep Passes on the Thorne Bay Ranger District, Ketchikan Area.

Zemke, S. V. A Hierarchical Approach to Restoration and Habitat Protection Planning within the Exxon Valdez Oil Spill Impacted Area.

Wedemeyer, K. A Feasibility Assessment for Sockeye Salmon Enhancement in Coghill Lake, Prince William Sound, Alaska.

MULTI-REGIONAL RESEARCH/FHR

Williams, T.V., G.H. Reeves. Genetic Diversity of Coastal Cutthroat Trout.

Purpose is to document diversity of anadromous cutthroat trout (*Oncorhynchus clarki*) throughout their range from northern California to southeast Alaska. Genetic (allozymes) and meristic characteristics of populations across this area are being determined. More than 35 populations in Alaska were examined. There appears to be wide amount of variation among populations in genetics and meristics. This study will provide information on variation within these species and aid in identification of stocks and evolutionary significant units (ESUs). Sampling will be completed in 1995 and results available in early 1996.

Wright, B. E., M. D. Bryant, and D. N. Swanston. Response of Aquatic Ecosystems in Karst Landscapes.

Technology Transfer

Karryl Johnson, fish biologist, Petersburg District, Stikine Area wrote several productions for The Tongass Journal (a radio program originally developed by biologist Sue Jennings). The projects objective is to inform the general radio listening public of pacific salmon life history, behavior, habitat relationships, and social importance.

Ron Dunlap, FHR coordinator, participated on a Alaska Chapter, American Fisheries Society, continuing education committee to develop and implement the symposium "Aquatic Habitat Restoration in Northern Ecosystems". The symposium brought together representatives from industry and municipal, state and federal agencies to consider restoration needs in a variety of aquatic habitats.

Mark Wipfli, Aquatic Entomologist at the Juneau Forest Sciences Laboratory, participated in the Chinook and Coho Restoration Workshop poster session. Mark's presentation is titled "Terrestrial and aquatic macroinvertebrates in stream food webs: their importance to juvenile salmonids in streams within old- and new-growth forest ecosystems".

Ron Dunlap, FHR coordinator, participated on the Alaska Chapter, American Fisheries Society (AFS) "Stocks at Risk" committee. A grant from the PEW Foundation, through the AFS parent society, made possible a compilation and analysis of all available salmon population and harvest data bases in southeast Alaska. A final report on the health of stocks in southeast Alaska will be published in an issue of "Fisheries magazine" during 1995. Data for salmon stocks through out the remainder of Alaska will be analyzed as it is made available by the state fisheries management agency.



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